

AMENDMENTS TO THE CLAIMS

1. (AMENDED) A modular thermal reformer system assembly, comprising:
a top end plate;
a bottom end plate; and
a plurality of planar modular assembly including a reformer elements zone stacked together between the top end plate and the bottom end plate; wherein each modular element comprises:
a combustion zone, an inlet-reformate inlet component layer;
a process fluid manifold, an outlet reformate outlet component layer;
a process fluid manifold, an inlet combustion inlet component layer;
a fluid manifold, an combustion outlet component layer; and a reformation cavity and combustion cavity centrally located within the modular reformer element;
outlet combustion fluid manifold, an inlet reformate process fluid flow passage connecting the inlet reformate process fluid manifold and the reformer zone, an outlet reformate process fluid flow passage connecting the reformer zone and the outlet reformate process fluid manifold, an inlet combustion fluid flow passage connecting the inlet combustion fluid manifold and the combustion zone, and an outlet combustion fluid flow passage connecting the combustion zone and the outlet combustion fluid manifold;
wherein the reformate inlet component layer comprises an inlet reformate manifold located at an outer edge of the reformate inlet component layer , an inlet reformate process fluid flow passage , and an inlet flow distribution region , wherein the inlet reformate manifold allows for entry of a reformate process fluid into the inlet reformate process fluid flow passage for the inward flow of reformate process fluid towards the inlet flow distribution region and into the centrally located reformation cavity; and,
wherein the reformate outlet component layer comprises a reformate outlet manifold located at an outer edge of the reformate outlet component layer , an outlet reformate process fluid flow passage and an outlet distribution region , wherein the outlet reformate process fluid flow passage allows for the outward flow of reformate process fluid from the centrally located

reformation cavity and the outlet distribution region and the reformat outlet manifold allows for the exit of reformat process fluid from the outlet reformat process fluid flow passage.

2. (AMENDED) The assembly ~~thermal reformer system~~ of claim 17, wherein said the inlet reformat ~~[[er]] inlet component layer zone~~ and combustion inlet component layer zone are be in thermal contact to promote transfer of combustion heat into said the reformat inlet component layer ~~reformer zone to drive a reaction in said reformer zone.~~

3. (CANCELED) ~~The thermal reformer system of claim 1, wherein said reaction is a reformation reaction that produces at least hydrogen as a product of said reaction.~~

4. (CANCELED) ~~The thermal reformer system of claim 1, wherein a primary reactor zone is provided, consisting of said reformer zone and said combustion zone, centrally located within said assembly.~~

5. (CANCELED) ~~The thermal reformer system of claim 1, wherein a plurality of planar assemblies are stacked one atop the other to provide a modular reformer assembly of one or more individual assemblies.~~

6. (AMENDED) The assembly ~~thermal reformer system~~ of claim 17, wherein said inlet combustion ~~reformat~~ process fluid flow passage is in thermal contact with said outlet combustion ~~reformat~~ process flow passage and/or said outlet combustion fluid flow passage to promote — transfer — of — heat — from — outlet — fluid(s) — to — inlet — fluid(s).

7. (AMENDED) The assembly ~~thermal reformer system~~ of claim 1, wherein said inlet reformat process fluid flow passage is located circumferentially within the assembly ~~extending counter-clockwise from the inlet reformat manifold located at an outer edge of the reformat inlet component layer towards the inlet flow distribution region and into the centrally located reformation cavity, and wherein the outlet reformat process fluid flow passage extends clockwise from the centrally located reformation cavity and the outlet distribution region~~

towards the reformat outlet manifold located at an outer edge of the reformat outlet component layer.

8. (CANCELED) ~~The thermal reformer system of claim 1, wherein inlet combustion fluid flow manifold is divided into an inlet combustion air manifold and an inlet combustion fuel manifold.~~

9. (CANCELED) ~~The thermal reformer system of claim 1, wherein said inlet combustion fluid flow passage is divided into an inlet combustion air passage and an inlet combustion fuel passage.~~

10. (CANCELED) ~~The thermal reformer system of claim 1, wherein said inlet reformat process fluid manifold is divided into an inlet water/steam manifold and inlet fuel/water/steam manifold.~~

11. (CANCELED) ~~The thermal reformer system of claim 1, wherein said inlet reformat process fluid flow passage is divided into an inlet water/steam passage and an inlet fuel/water/steam manifold.~~

12. (CANCELED) ~~The thermal reformer system of claim 11, wherein said inlet water/steam passage and said inlet fuel water/steam manifold are connected prior to entering said reformer zone.~~

13. (CANCELED) ~~The thermal reformer system of claim 1, wherein said outlet reformat process fluid flow passage is divided into any one of a preshift flow passage, a shift reactor, and a post shift flow passage.~~

14. (CANCELED) ~~The thermal reformer system of claim 13, wherein said preshift flow passage or said post shift flow passage are single or multiple passages connecting said outlet reformat process fluid manifold and a primary reactor zone.~~

15. (CANCELED) ~~The thermal reformer system of claim 13, wherein said preshift flow passage and said post shift flow passage are provided in a countercurrent configuration, respectively, such that flow therein flow in opposing directions or wherein said preshift flow passage and said post shift flow passage are both provided in a configuration such that flows therein flow concordantly in same general direction within said planar assembly.~~

16. (AMENDED) The modular thermal reformer system assembly of claim 1, wherein ~~one or more of said inlet~~ the reformate outlet process fluid manifold is in fluid connection with , an outlet reformate process fluid a manifold of the reformate inlet component layer ~~an inlet combustion fluid manifold, an outlet combustion fluid manifold is external to said planar assembly.~~

17. (AMENDED) The modular thermal reformer assembly system of claim 1, wherein ~~said the assembly is constructed of sheet metal components. the combustion inlet component layer comprises a combustion inlet manifold located at an outer edge of the combustion inlet component layer , an inlet combustion process fluid flow passage and a combustion fluid flow distribution region , wherein the a combustion inlet manifold allows for entry of a combustion process fluid into the inlet combustion process fluid flow passage for the inward flow of combustion process fluid towards the combustion fluid flow distribution region and into the centrally located combustion cavity; and,~~

combustion outlet component layer comprises a combustion outlet manifold located at an outer edge of the combustion outlet component layer , an outlet combustion process fluid flow passage and an outlet distribution region , wherein the outlet combustion process fluid flow passage allows for the outward flow of combustion process fluid from the centrally located combustion cavity and the outlet distribution region and the combustion outlet manifold allows for exit of the combustion process fluid from the outlet combustion process fluid flow passage.

18. (CANCELED) ~~The thermal reformer system of claim 1, wherein at least one of said an inlet reformate process fluid flow passage, outlet reformate process fluid flow passage,~~

~~inlet combustion fluid flow passage, reformer zone and combustion zone are created by pressed sheet metal components.~~

19. (NEW) The modular thermal reformer assembly of claim 1, wherein inlet combustion process fluids flow to the combustion inlet manifold through a manifold port of the reformat inlet component layer and a manifold port of the reformat outlet component layer; and,

wherein the combustion outlet manifold is in fluid connection with a manifold of the combustion inlet component layer, a manifold port of the reformat outlet component layer, and a manifold port of the reformat inlet component layer.

20. (NEW) The modular thermal reformer assembly of claim 1, wherein inlet reformat process fluids flow through a manifold port of the combustion inlet component layer and a manifold port of the combustion outlet component layer, and wherein outlet reformat process fluids flow through a manifold port of the combustion inlet component layer and a manifold port of the combustion outlet component layer; and,

wherein the reformation cavity is in thermal contact with the combustion cavity.

21. (NEW) The assembly of claim 17 wherein the inlet combustion process fluid flow passage extends counter-clockwise from the combustion inlet manifold located at an outer edge of the combustion inlet component layer towards the combustion fluid flow distribution region and into the centrally located combustion cavity, and wherein the outlet combustion process fluid flow passage extends clockwise from the centrally located combustion cavity and the outlet distribution region towards the combustion outlet manifold located at an outer edge of the combustion outlet component layer.